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Acid Base Review
Pre-AP

Complete on a separate sheet of paper. You really should complete this in order to insure you are prepared for the test. Use all of the formulas you have been given in class while completing.

1. Calculate the pH for each of the following solutions:
a) $[H^+] = 1x10^{-3}$ b) $[H^+] = 1x10^{-9}$
c) $[OH^-] = 1x10^{-5}$ d) pOH = 5.5

2. Solution "A" has a $[H^+]$ of $3.9E^{-5}$. Solution "B" has a pH of 5.70. Which is more acidic? Which is more basic?

3. Write the formula for the following:
a) conjugate base of H_2SO_3 b) conjugate acid of CN^- c) conjugate acid of S^{-2}
d) conjugate base of HClO e) conjugate acid of HCO_3^- f) conjugate base of NH_3
g) conjugate acid of $H_2PO_4^-$ h) conjugate base of H_3O^+

4. In which of the following pairs of substances do the two members constitute a conjugate acid-base pair?
a) HCN and CN^- b) H_3PO_4 and PO_4^{-3} c) HCO_3^- and HSO_4^- d) NH_4^+ and NH_3
e) HN_3 and N_3^- f) H_2SO_4 and SO_4^{-2} g) H_2CO_3 and HSO_4^- h) NH_3 and NH_2^-

5. Determine the pH of each of the following solutions. Is each solution acidic, basic, or neutral?
a) 1.5 M HBr b) 1.5 M KOH c) $8.5x10^{-4}$ M $Ca(OH)_2$

6. Calculate the $[H^+]$ in each of the following solutions. Is each solution acidic, basic, or neutral?
a) $[OH^-] = 6.0x10^{-3}$ b) pH = 1.33 c) pOH = 3.20 d) pOH = 8.65

7. How many times more acidic is a solution with pH = 4.80 as compared to one with pH = 6.33?

8. Calculate the pH and pOH of a solution prepared by dissolving 0.93 g of HCl in enough water to give 0.40 L of solution.

9. What is the molarity of a H_3PO_4 solution if 32.7 mL of a 0.100 M KOH solution is required to completely neutralize 50. mL of the acid?

10. What volume of 0.400 M H_2SO_4, in mL, would be needed to titrate 375 mL of a 0.225 M $Ba(OH)_2$ solution?

11. Write the net ionic equation for the reaction between nitric acid and barium hydroxide.

12. Classify each reactant as either a Bronsted-Lowry acid or base for the following reactions:
a) $HCN + H_2O \rightarrow CN^- + H_3O^+$
b) $CH_3NH_2 + H_2O \rightarrow CH_3NH_3^+ + OH^-$

13. Does the pH of a solution increase, decrease, or stay the same when you add H^+ to a 0.10 M solution of NH_3?

14. A 1000. mL solution of HCl has a pH of 1.30. How many grams of HCl are dissolved in the solution?

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15. The antacid called "Milk of Magnesia" contains 800.0 mg of $Mg(OH)_2$ per 2 teaspoons. The typical stomach pH is 1.420. How many mL of stomach acid (HCl) are neutralized by 2 Tablespoons of Milk of Magnesia? (1 Tablespoon = 3 teaspoon)

16. Two solutions are mixed: 5.00 mL of 2.50 M HBr and 7.00 mL of 2.00 M LiOH. What is the final pH after mixing? (Hint: consider any possible reaction)

17. After the standardization titration of KOH with KHP (see data table below). A student wanted to find the pH of juice. Use the data below to fin the pH of the Juice. M.M. KHP=204g/mol. Assume 1:1 ratio of KOH to Juice. All titration to endpoint

Trial	Mass KHP (g)	Vol_I KOH	Vol_F KOH	Vol_{Tolal} KOH	M KOH	$M_{average}$ KOH
1	0.401g	2.1mL	25.7mL			
2	0.403g	25.7mL	49.0mL			
3	0.397	0.0mL	23.0mL			

Trial	Vol. Juice	Vol_I KOH	Vol_F KOH	Vol_{Tolal} KOH	M of $[H^+]$ in Juice	pH	$pH_{average}$
1	15mL	23.0mL	30.1mL				
2	14.1mL	30.1mL	35.9mL				
3	14.8mL	35.9mL	42.2mL				

18. ~~a) How do the three (3) definitions of an acid differ?~~

~~b) How do the three (3) definitions of a base differ?~~

19. Describe the set up and implementation of an acid base titration we conducted in class.

20. a) What color does blue pH paper turn in a base? An acid?

b) What color does red pH paper turn in a base? An acid?

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Answers

1. a) 3.0 b) 9.0 c) 9.0 d) 8.5
2. Solution "A": pH = 4.41; Solution "B": $[H^+] = 2.0x10^{-6}$. Therefore, "A" is more acidic and "B" is more basic.
3. a) HSO_3^- b) HCN c) HS^- d) ClO^- e) H_2CO_3 f) NH_2^- g) H_3PO_4 h) H_2O
4. (a) (d) (e) (h) are all conjugate acid base pairs
5. a) –0.18 (acidic) b) 14.18 (basic) c) 11.23 (basic)
6. a) 1.7E-12 M (basic) b) 0.047 M (acidic) c) 1.6E-11 M (basic) d) 4.5E-6 M (acidic)
7. pH = 4.80 solution has $[H^+] = 1.6x10^{-5}$ M, pH = 6.33 solution has $[H^+] = 4.7x10^{-7}$ M. Therefore, the first solution is about 34 times more acidic.
8. pH = 1.19, pOH = 12.81
9. 0.022 M
10. 211 mL
11. $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$
    [Balanced equation: $2HNO_3(aq) + Ba(OH)_2(aq) \rightarrow Ba(NO_3)_2(aq) + 2H_2O\ (l)$]
12. a) HCN [acid] + H_2O [base] à $CN^- + H_3O^+$
    b) CH_3NH_2 [base] + H_2O [acid] à $CH_3NH_3^+ + OH^-$
13. pH will decrease (more acidic solution), 14. 1.8 g
15. 2200 mL
16. 13.10
17. $M_{avg.}$ KOH $=8.43x10^{-2}$ $M_{avg.}$ Juice $=3.65x10^{-2}$ **pH =1.47**
18.
19.
20. a) Blue paper = acid turns red b) Red paper= base turns blue